



Exploring the Potential Opportunities of the Wood Processing Industry in Cameroon

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Abstract

Cameroon's wood processing industry is vital to its economy, serving as a major exporter of timber and wood products. This diverse sector includes logging, sawmilling, wood veneer, and wood carving, catering to both domestic and international markets. With ample forest cover and a favorable location along the Gulf of Guinea, Cameroon is an attractive hub for wood processing and global exports. Embracing technology and sustainability will enhance the industry's reputation and spark growth. Investment opportunities exist throughout the value chain, from sustainable forestry management to furniture production. Partnerships can be formed for sustainable logging and state-of-the-art sawmills, while ventures in value-added wood products are also viable. Collaboration opportunities arise from the growing demand for certified sustainable wood products, involving certification bodies and quality assurance providers. The development of modern infrastructure, including processing facilities and transportation networks, creates investment avenues in logistics and support services. Eco-tourism and sustainable development initiatives open doors for ecologically conscious ventures like eco-lodges and nature-based experiences. The future of Cameroon's wood processing industry looks promising with a focus on value addition, diversification, and the integration of digital technologies and automation for increased efficiency and global competitiveness. Sustainability practices and certifications will attract environmentally conscious consumers and businesses. Research and development opportunities, such as engineered wood products and sustainable packaging, invite collaboration with academic and research institutions, fostering innovation and knowledge exchange within the industry.

Subject Areas

Production/Operations Management

Keywords

Wood Processing Industry, Infrastructure, Technology, Machinery, Certification, Cameroon

1. Introduction

Cameroon is rich in forest resources, covering more than half of its land area. In fact, it is home to the second-largest tropical rainforest in Africa, after the Democratic Republic of Congo, with approximately 45% of its surface covered by forests¹. This valuable asset has been leveraged by the country's wood processing industry, which has greatly contributed to its economy. Timber and wood products have emerged as major exports, positioning Cameroon as a leading wood exporter in Central Africa. Cameroon achieved a significant milestone in 2020 by emerging as the leading African exporter of processed wood, specifically timber². The country's remarkable record export value of \$611.9 million solidifies its position as one of the largest timber suppliers on the continent of Africa³. Impressively, the country is the top African exporter of tropical hardwood to the EU, predominantly supplying sawn timber to Spain and Italy⁴.

The industry encompasses a range of activities, including logging, sawmilling, and timber processing, which require a diverse workforce with various skill sets [1]. The significance of the wood processing industry in Cameroon extends beyond economic contributions. This sector plays a vital role in employment generation and serves as a key source of export revenues. It offers employment opportunities across various stages of the value chain, encompassing logging, harvesting, processing, and manufacturing [2]. Moreover, this employment not only helps to reduce unemployment rates but also contributes to poverty alleviation by enabling individuals to earn a stable income [3]. This is especially crucial in a country like Cameroon, where unemployment rates remain high, and job creation is an urgent concern.

Despite its impressive growth and economic impact, the wood processing industry in Cameroon faces several challenges. Illegal logging, unsustainable harvesting practices, and inadequate infrastructure pose significant obstacles [4]. To ensure the industry's long-term viability and competitiveness, it is imperative for the government and industry stakeholders to prioritize sustainable practices and invest in infrastructure development [5]. Nonetheless, numerous opportunities

¹<https://www.biodev2030.org/en/pays/cameroon/#:~:text=Cameroon%20has%20the%20second%20largest,its%20surface%20covered%20by%20forests>

²<https://smebluepages.com/timber-industry-statistics-in-africa/>

³<https://cameroontimberexport.com/biggest-timber-exporter-countries-of-africa>

⁴<https://flegtvpafacility.org/countries/cameroon/#:~:text=Cameroon%20is%20Africa%E2%80%99s%20largest%20exporter,goes%20to%20Italy%20and%20Spain>

exist for the wood processing industry in Cameroon, offering potential for growth while addressing environmental concerns. The country's vast forest resources make it an attractive destination for the industry [6]. Favorable climate conditions and diverse tree species contribute to the availability of high-quality timber for processing. Additionally, the government's commitment to promoting sustainable forestry practices and enforcing timber harvesting regulations has instilled investor confidence and attracted foreign partnerships [5] [6].

The growing global demand for eco-friendly and sustainable wood products has created a significant market for Cameroon's processed wood. By adhering to international standards for product quality and environmental sustainability such as Forest Stewardship Council (FSC) or Voluntary Partnership Agreements (VPAs)—Forest Law Enforcement Governance and Trade APV (FLEGT), Cameroon has positioned itself as a preferred supplier in the global wood market. Modern processing techniques and infrastructure development will further enhance the industry's competitiveness, enabling it to meet evolving international demands [7]. Hence, the wood processing industry in Cameroon offers promising prospects, that could significantly impact employment opportunities, foreign investments, and the diversification of the local and regional economy [8]. It presents the opportunity to develop a skilled workforce, consequently generating jobs for the local population. Moreover, by adding value to raw wood materials, for example, Cameroon can increase its export revenue and reduce its reliance on oil exports. This study provides an overview of the potential opportunities within the wood processing industry in Cameroon. It highlights the industry's economic implications in terms of job creation and revenue generation. By examining these supporting points, we gain a comprehensive understanding of the potential opportunities that lie within Cameroon's wood processing sector.

2. Methods

This research embraces a qualitative research approach and draws on secondary data gathered from reputable sources, such as peer-reviewed literature, agency reports, published papers, books, and reports from relevant governmental and non-governmental organizations (NGOs). The data collection process occurred between January 1990 and December 2023, involving searches on popular search engines like Google scholar and Bing. The search terms encompassed between Cameroon and "wood transformation," or "industry," or "investment," or "illegal logging," or "unsustainable forest management," or "technology," or "innovation," or "infrastructure," directing the acquisition of pertinent information for the study.

3. Opportunities of Wood Transformation Industry in Cameroon

3.1. Infrastructure Development

The wood transformation industry in Cameroon has significant potential for

growth and development, but it faces several challenges that hinder its progress. However, the development of infrastructure, such as *transportation networks, access to electricity and storage facilities*, can play a crucial role in overcoming these obstacles. For instance, improving transportation infrastructure, such as roads and rail networks, can enhance the industry's connectivity to markets, enabling efficient movement of raw materials and finished products [9] [10]. This, in turn, will facilitate the efficient transportation of raw materials and finished products. According to Cerbu *et al.* [11], a well-developed transportation infrastructure is essential for ensuring timely and efficient delivery of wood products, thereby minimizing transportation costs and increasing market competitiveness. Cameroon has approximately 50,000 kilometers of road infrastructure, comprising 30,000 kilometers of rural roads and 20,000 kilometers of national, regional, and local roads (Figure 1).

Unfortunately, only 10% of these roads are suitable for traffic, and they are frequently obstructed by toll posts over short distances and the movement of large cargo vehicles. Yet, the condition and quality of roads have a negative and significant effect on the marketing of economic activities [12].

The wood processing industry in Cameroon heavily relies on electricity to power its machinery and equipment, such as sawmills and wood processing units. This access to electricity has significantly revolutionized the industry, enabling the adoption of advanced wood processing techniques like computer numerical control machining, leading to enhanced precision and customization in woodwork [3]. Consequently, the availability of electricity has not only transformed the wood processing industry in Cameroon but has also facilitated the production of high-quality wood products meeting international standards, thereby bolstering the industry's competitiveness both domestically and internationally [13].

The lack of access to electricity in Cameroon is estimated to cost the economy about 2% of GDP growth, posing a serious threat to sustainable growth [14] [15]. From 1991 to 2021, the availability of electricity in Cameroon has exhibited a varying trend, with the lowest and highest recorded values being 29% and 65%, respectively. (Figure 2) Limited access to electricity hinders the wood industry's growth and efficiency, resulting in decreased productivity and competitiveness [16]. Prior to access to electrical power, the industry had to resort to alternative energy sources such as biomass, charcoal, and diesel generators, which were not only costly but also environmentally unsustainable. Hence, addressing these issues is imperative for the sustainable development of the wood transformation industry in Cameroon.

On the other hand, the inadequate storage infrastructure in the country has a detrimental impact on the industry's operations [13]. For example, the development of storage facilities in the wood industry provides a solution to various challenges related to product preservation, diversity, and quality assurance. These facilities offer a wide range of benefits that encompass both operational

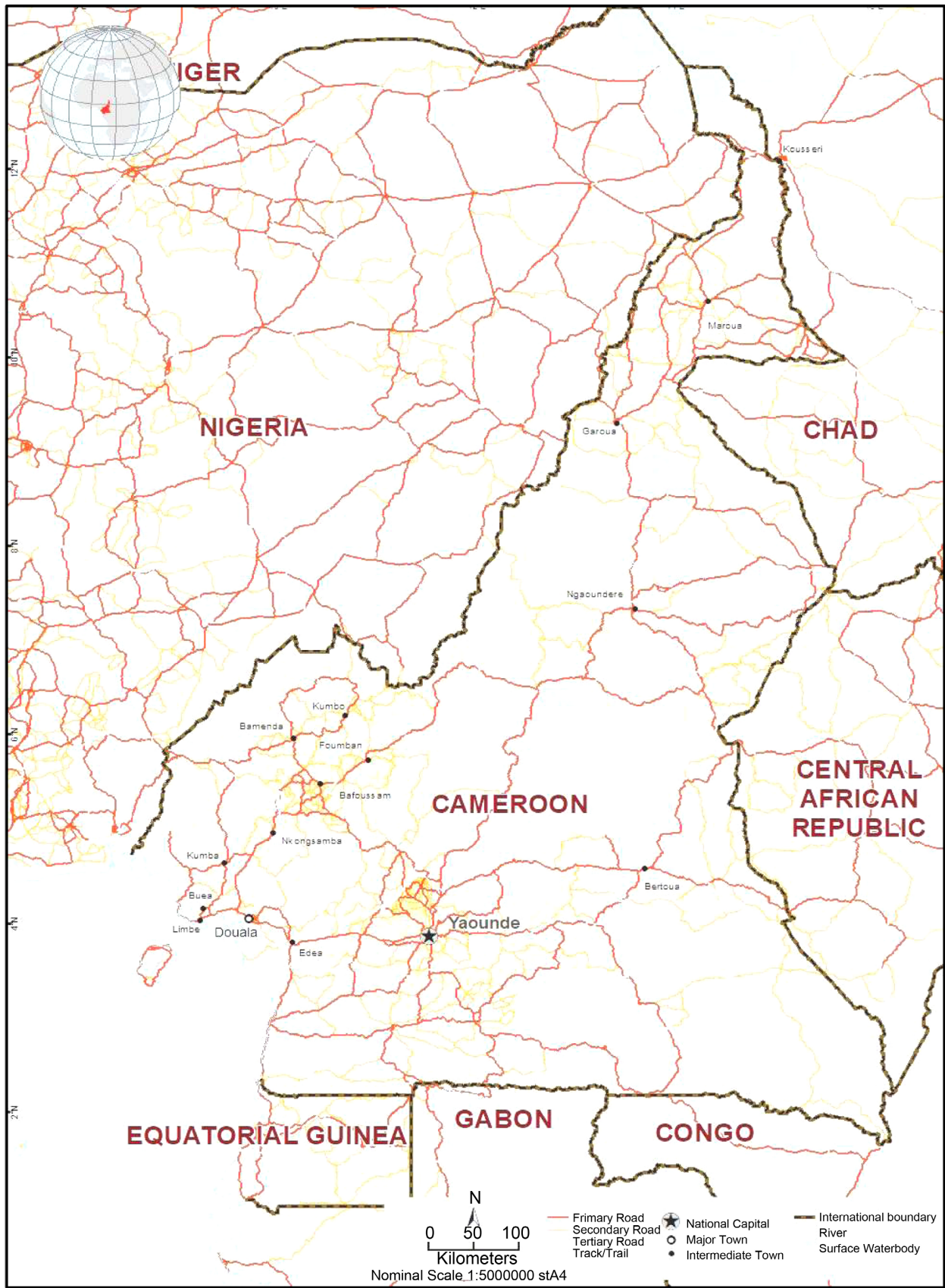


Figure 1. Cameroon road network.

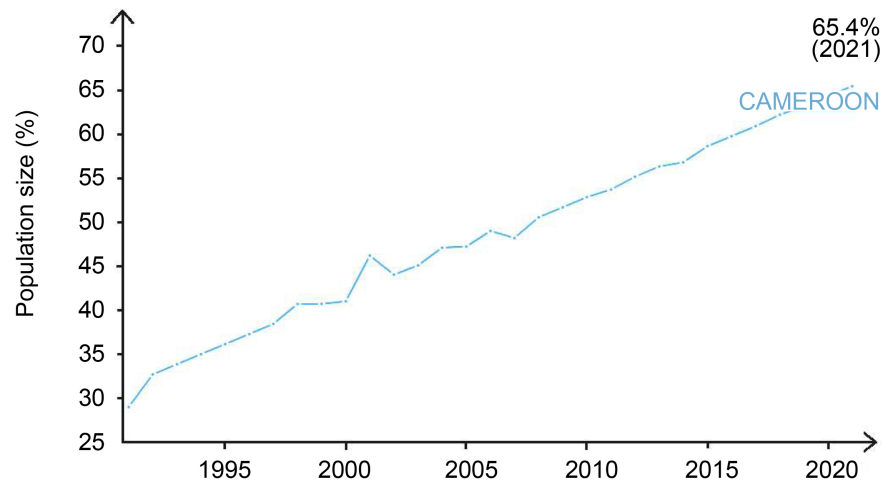


Figure 2. Pattern of population having access to electricity in Cameroon from 1991-2021⁵.

efficiency and economic advantages. First and foremost, storage facilities create a secure and controlled environment for storing wood inventory, safeguarding it from deterioration caused by factors like humidity, pests, and temperature fluctuations. Moreover, these facilities enable the industry to maintain a steady supply of raw materials throughout the year, even during periods of low production or when wood supply is limited. This preservation of raw materials ultimately leads to the production of higher-quality end products, reducing the need for rework and increasing customer satisfaction. According to Nzotcha and Kenfack [3], storage facilities allow for the proper organization and protection of raw materials, ensuring their quality and minimizing losses due to decay or damage. Furthermore, by integrating advanced storage facilities, the industry has been able to meet the growing demands of the market while maintaining consistent product quality. This enhanced production capacity has positioned Cameroon as a trustworthy supplier of high-quality wood products, gaining recognition and trust in both domestic and international markets [17]. A positive reputation for trustworthiness is crucial for fostering strong business relationships and attracting potential customers [18]. Moreover, efficient storage has facilitated the diversification of wood products, enabling manufacturers to expand their offerings and cater to a broader range of customer requirements. The ability to adapt and offer a variety of products has contributed to the industry's resilience and sustained growth in the ever-changing market dynamics.

3.2. Technology and Machinery Upgrades

Numerous wood transformation enterprises in Cameroon continue to rely on traditional methods and outdated equipment, which hampers their efficiency and productivity [19]. This lack of access to modern technology not only limits the sector's ability to meet growing demand but also affects the quality of the

⁵Access to electricity (% of population)—Cameroon.

products. By upgrading sawmills, kilns, and processing equipment, the industry can enhance its overall value chain. Although training programs have been implemented to improve the capabilities of wood processing actors in Cameroon, there is still a need for technological and machinery upgrades. Hence, investing in modern technology and machinery holds the potential to significantly improve the efficiency and quality of wood processing operations.

Furthermore, STBK has implemented quality management and traceability systems. Through the use of barcodes and tracking software, the origin of the wood used in production can be traced, ensuring its legality and sustainability. The adoption of these advanced technologies allows STBK to produce high-quality wood products while adhering to international sustainability and environmental protection standards. These technological advancements also contribute to increased efficiency and productivity within the company, enabling STBK to remain competitive in the global wood market.

Yet, there is room for further improvement, particularly regarding outdated machinery. Implementing technology and machinery upgrades can have profound impacts on efficiency, leading to improved productivity and reduced costs [20]. These upgrades also result in enhanced product quality and greater environmental sustainability. According to Kenfack [21], the introduction of modern equipment, such as computer-controlled sawmills and automated wood processing machines, has increased the efficiency of wood transformation processes in the country by boosting productivity and reducing processing time. Such automation not only saves time and reduces the need for manual labor but also enhances precision and accuracy in wood processing, minimizing the risk of human error and producing higher-quality finished products. This increased speed of production allows manufacturers to meet customer demands in a timely manner. Technological advancements have enabled wood processing companies to efficiently meet the growing demand for wood products.

Furthermore, technology has facilitated better inventory management and supply chain coordination. Advanced software systems enable companies to track inventory levels in real-time, optimize procurement processes, and ensure timely delivery of raw materials [22]. This reduces wastage and eliminates stockouts. Additionally, advanced machinery has contributed to waste reduction during the wood transformation process and optimized resource utilization, promoting sustainable practices in the wood transformation industry [13]. Raw material loss in wood cutting industries reaches high proportions, ranging from 30% to 36% of volume yield [19]. With precise cutting and shaping capabilities, the likelihood of material wastage decreases, resulting in cost savings for companies. Moreover, the implementation of technology has also enhanced the quality of wood products by producing more precise and consistent cuts. These improvements in the wood processing sector lead to increased efficiency, improved productivity, and higher product quality, ultimately boosting customer satisfaction and market competitiveness for Cameroonian wood processing companies

[23]. For example, between 2011 and 2020, Cameroon recorded a trade value of over 8,115,849 US dollars in primary processed wood products in Central Africa (Figure 3) (ANRC, 2021) [24]. Moreover, export volumes experienced an impressive growth of almost 40%⁶. This growth can be attributed to various factors, such as an increase in export prices and the country's efforts to expand its international economic agreements. However, it is important to note that Cameroon's economy still faces challenges, including a high reliance on international aid and grants, as well as a trade deficit. These statistics demonstrate the substantial trade volume within the wood processing industry in the region, emphasizing the economic significance of the sector and underscoring the potential for growth in Cameroon's wood and wood products industry.

3.3. Value Addition, Domestic Processing, and Product Diversification

The wood transformation industry in Cameroon presents immense opportunities for value addition and domestic processing. This industry plays a significant role in the country's economy, and understanding its current state and potential for growth is crucial. Additionally,

Moreover, promoting domestic processing within this industry is essential for maximizing local participation, reducing dependency on imports, and fostering sustainable development. Value addition in Cameroon's wood transformation industry brings economic benefits through activities such as processing and manufacturing. It involves converting raw timber materials through various processes, including processing, manufacturing, and packaging, into finished products like furniture, flooring, and construction materials [25]. This has led to an increase in their value and the creation of many economic opportunities.

Firstly, it leads to more jobs, ranging from carpenters to designers [24]. By shifting its focus from simply exporting raw timber to converting it into

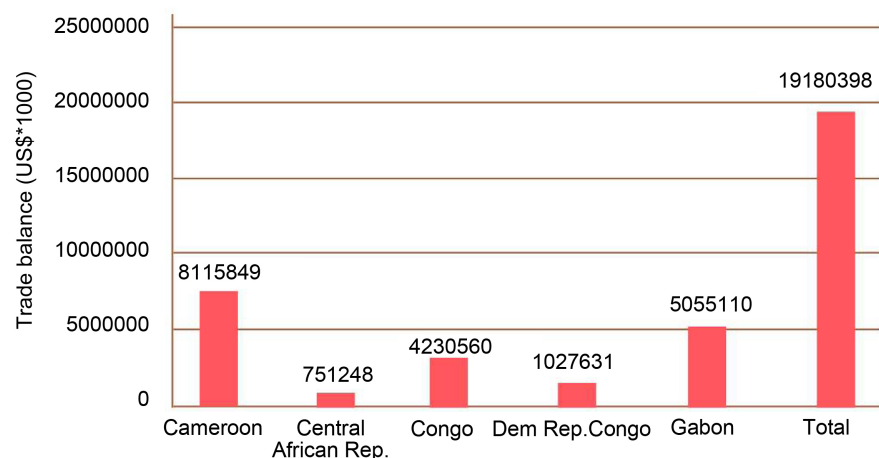


Figure 3. Trade balances of primary processed wood products in Central Africa by countries (2011-2020). Source ANRC (2021) [24].

⁶<https://www.cia.gov/the-world-factbook/about/archives/2022/field/economic-overview/>

high-value wood products, this sector has the potential to create jobs for carpenters, woodworkers, designers, engineers, and skilled laborers. Secondly, it stimulates the manufacturing sector, attracting investors and generating revenue [26]. For example, when investors see the potential for value addition in the wood transformation industry, they are more likely to be attracted to the market. Value-added products have higher profit margins compared to raw materials, leading investors to perceive the industry as profitable. Lastly, it enhances export potential, tapping into international markets for high-quality wood products [13]. Indeed, value addition opens up opportunities for the industry to engage in branding and marketing efforts. The promotion of the unique characteristics and craftsmanship of their wood products can help establish Cameroon's reputation as a provider of premium goods. This, in turn, helps build trust and attract a loyal customer base in international markets.

Promoting domestic processing in the wood transformation industry in Cameroon is because it can lead to increased value addition and economic benefits. According to Duguma *et al.* [27], domestic processing allows for the creation of finished wood products that have higher value compared to raw materials. This value addition can result in increased revenue generation, job creation, and overall economic growth. Additionally, promoting domestic processing helps in reducing the country's reliance on the export of raw timber. In 2020, Cameroon's imports of timber and timber products reached a total value of approximately US\$129.9 million, rebounding from a minor decline to US\$124.9 million in 2019 (Figure 4).

Currently, Cameroon exports a significant amount of unprocessed timber, resulting in the loss of potential revenue and job opportunities within the country. By encouraging domestic processing, Cameroon can retain a larger portion of the value chain and create more economic opportunities. Domestic processing also contributes to the sustainable growth of the wood industry.

It enables countries to have greater control over the quality and efficiency of production processes, leading to higher value-added products. This enhances the

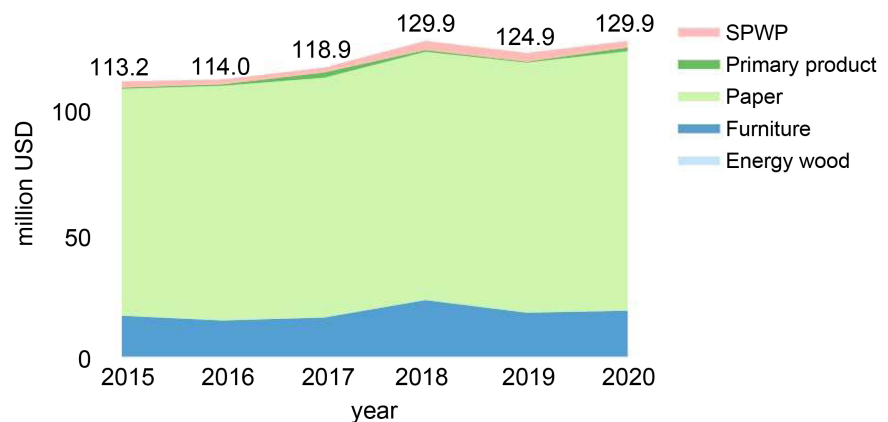


Figure 4. Cameroon's leading import product flows (data source from STIX)⁷.

⁷<https://flegtimm.eu/country-profiles/cameroon/>

competitiveness of the wood industry in the global market. Furthermore, domestic processing reduces transportation costs and carbon emissions associated with long-distance transportation of raw materials [28]. This aligns with sustainable development goals and promotes environmentally friendly practices. Prioritizing domestic processing also supports the sustainable management of forests. By utilizing locally sourced timber, the wood industry reduces the pressure on forests and promotes responsible forestry practices.

Product diversification in the wood industry requires careful planning and effective strategies. One strategy is developing new products that align with market demands and trends. This involves conducting market research to identify customer preferences. Wood companies can also enhance the value of existing products through innovation and differentiation. By incorporating new technologies and improving sustainability, companies can attract a broader range of customers. Collaboration and partnerships with other industry players can also be effective. By working together, companies can pool resources and reduce risks. Implementing product diversification in the wood industry requires market research, innovation, differentiation, and collaboration. Diversifying products in Cameroon's wood industry can lead to increased market opportunities and reduced dependence on exporting raw timber. Companies can tap into different market segments by producing value-added wood products like furniture and flooring. Diversification can mitigate risks associated with timber prices and promote sustainable forest management. Product diversification benefits the wood industry by offering economic, environmental, and market advantages. It is a crucial strategy for businesses in today's dynamic environment. Case studies in Cameroon have shown the positive impact of product diversification. Companies have expanded their customer base, increased revenue, and differentiated themselves from competitors. These success stories highlight how diversification enables businesses to adapt, expand, and enhance competitiveness.

Implementing product diversification in the wood transformation industry requires careful planning and effective strategies. According to Hurmekoski *et al.* [29], developing new products that align with market demands and conducting market research to identify emerging customer preferences are crucial strategies. By staying informed about changing market dynamics, wood companies can adapt their product offerings and attract a wider customer base. Another strategy is enhancing the value proposition of existing products through innovation and differentiation, such as incorporating advanced processing methods or eco-friendly production techniques. This improves the quality and sustainability of products, differentiating wood companies from competitors and attracting a broader range of customers. Collaboration and partnerships with industry players also contribute to product diversification by leveraging collective resources and reducing risks and costs. By adopting a combination of strategies including market research, innovation, differentiation, and collaboration, wood companies can expand their offerings and enhance their competitiveness. Product diversifi-

cation in the wood industry has significant benefits for Cameroon as it leads to increased market opportunities, reduced dependence on raw timber exports, and mitigation of risks associated with timber price fluctuations [30]. Furthermore, diversification contributes to sustainable forest management and conserves biodiversity. Product diversification is a crucial strategy for businesses to remain competitive in today's dynamic environment. In Cameroon, successful case studies have demonstrated the positive impact of diversification, allowing companies to tap into new market segments, broaden their customer base, and increase revenue [31]. These success stories showcase how diversification enables businesses to adapt to consumer demands, expand their market reach, and enhance overall competitiveness.

3.4. Skill Development and Training of Wood Transformation Industry in Cameroon

Training programs and skill development initiatives in wood processing techniques offer tremendous potential to enhance the capabilities and expertise of the workforce in Cameroon's wood transformation industry. By providing individuals with the necessary skills, these programs enable the industry to produce high-quality wood products and enhance its competitiveness in both domestic and international markets. However, the advancement of technology demands that employees continuously update their skills, which can be a daunting task due to the significant time and financial investment required [32].

In order to meet industry demands, it is essential to enhance the capabilities of wood processing professionals in Cameroon by developing a skilled workforce that can contribute to the industry's growth and enhance its global competitiveness. This is particularly crucial as the forestry sector plays a pivotal role in the country's economy. Currently, there is significant infrastructure development taking place in the wood transformation industry, with a specific focus on improving the skills of forestry professionals. Notably, leading universities in Cameroon, such as the Universities of Ebolowa, Dschang, and Bertoua, have launched new training programs with the objective of enhancing professional training and increasing the wood processing industry's contribution to the overall industrial sector. By doing so, the aim is to bridge the existing skills gap in the wood processing sector, creating an industry with skilled professionals capable of adopting sustainable practices and utilizing innovative technologies [1]. These educational institutions play a crucial role in training a new generation of forestry professionals, equipping them with the necessary skills and knowledge to make effective contributions to the wood processing industry, which is vital for the economy of Cameroon [33].

Cameroon faces high unemployment rates among university graduates and inefficiency in the tertiary education system. The unemployment rate in Cameroon has increased to about 65% in the period 2007-2022 (**Figure 5**). Factors such as *graduates lacking job-seeking knowledge*, the *absence of entrepreneurship in the curriculum*, and the *lack of employability skills* contribute to the

unemployment problem^{8,9}. Additionally, *the quality of training* does not generally align with the needs of employers, and there is a stigma against vocational and technical programs. *Gender and religion issues, overdependence on government jobs, high competition in the job market, and barriers related to disability, language, and corruption* further compound the problem^{10,11}. Moreover, *uncompetitive salaries* in certain sectors also discourage graduates from accepting employment opportunities [34]. This context highlights the need for qualified workers in specialized areas and the importance of investing in technical education and infrastructure development.

To tackle these challenges, it is crucial for Cameroon to invest in specialized higher education in engineering, technology, and management. Furthermore, strategies to improve skill development and training in the wood transformation industry can be implemented. One effective strategy is the *establishment of vocational training centers* that focus on wood transformation skills, providing practical training in carpentry, joinery, and wood carving. Aligning the curriculum of these centers with industry needs through *collaboration between experts and educational institutions* is essential. Additionally, *implementing apprenticeship programs* will facilitate the transfer of traditional woodworking

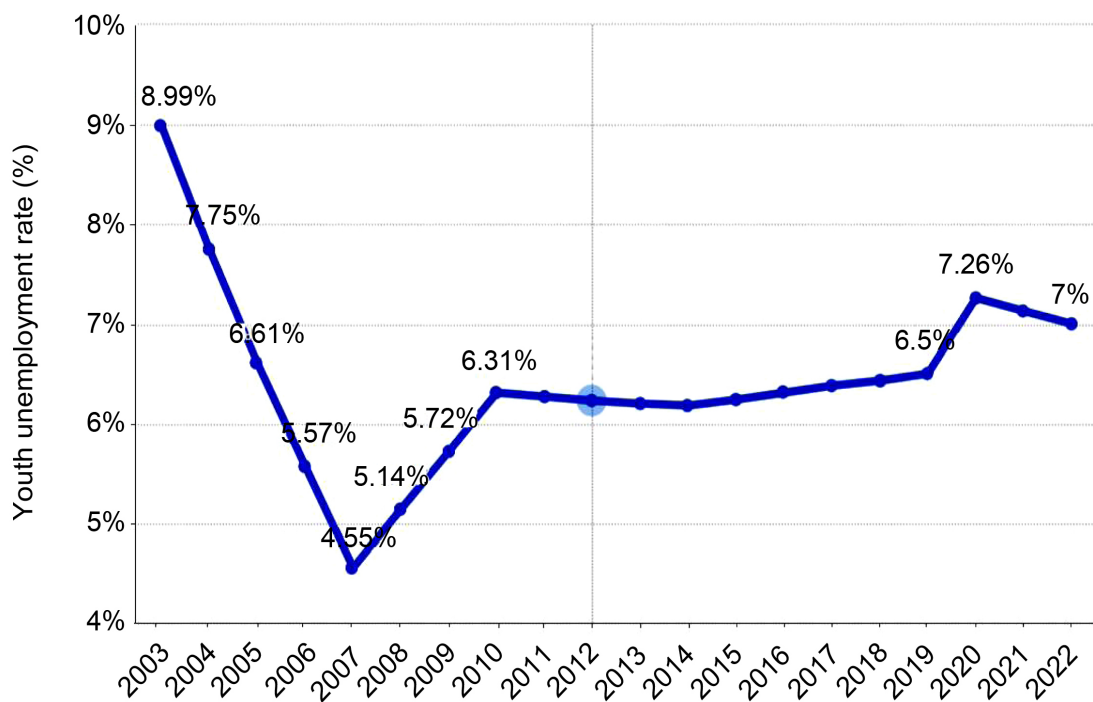


Figure 5. Youth unemployment rate from 2003 to 2022 in Cameroon¹².

⁸<https://www.ipl.org/essay/Causes-Of-Unemployment-In-Cameroon-PCAE5PAQU>

⁹<https://www.worldbank.org/en/news/feature/2012/03/22/cameroon-universities-debate-unemployment>

¹⁰<https://project-house.net/why-many-cameroonian-graduates-are-unemployed/>

¹¹<https://www.worldbank.org/en/news/feature/2012/03/22/cameroon-universities-debate-unemployment>

¹²<https://www.statista.com/statistics/811928/youth-unemployment-rate-in-cameroon/>

techniques and craftsmanship while bridging the gap between theory and practice.

On the other hand, the enhancement of secondary technical education is crucial as it offers an alternative route for students who choose not to pursue higher education. Apprenticeship programs in various fields, including construction, computer science, and transportation, provide opportunities for skilled employment. Remarkably, more than half of the existing job market comprises positions that do not require a traditional four-year university degree. Associate degree programs are experiencing remarkable growth and have become a preferred pathway to access intermediate skilled jobs.

3.5. Legal Compliance and Certification

Legal compliance and certification are crucial in the wood industry in Cameroon, ensuring sustainable practices and protecting the environment. Achieving compliance and certification can be a good opportunity for wood industry by implementing proper documentation and responsible sourcing. Strict legal compliance is of utmost importance for individuals and businesses operating in Cameroon. The country's legal system is rooted in civil law, which draws from French legal traditions. It is characterized by the coexistence of two distinct and at times conflicting legal systems, namely the English common law and the French civil law, which often delicately balance each other¹³. In order to ensure compliance, it is crucial to have a comprehensive understanding of and adherence to the diverse laws and regulations in Cameroon. This entails complying with labor laws, tax laws, intellectual property laws, and industry-specific regulations [35]. These laws aim to promote sustainable forest management, protect biodiversity, and ensure the fair distribution of benefits from the wood industry. Maintaining accurate and up-to-date records, as well as seeking guidance from legal experts familiar with the local legal framework, are also pivotal in navigating any legal complexities that may arise [36]. By making strict legal compliance a top priority, both businesses and individuals can operate within the confines of the law, mitigating potential legal issues or penalties. Although the Cameroonian government has implemented various regulations and policies to regulate the wood industry, such as the 1994 Forest Law and the 1995 Forest Code. However, enforcement of these regulations has been a challenge due to limited resources, corruption, and weak governance [37]. Therefore, it is essential for the government to strengthen its efforts to enforce legal compliance in the wood industry through increased funding, capacity building, and anti-corruption measures. Only by ensuring strict adherence to regulations can the wood industry in Cameroon thrive sustainably and contribute to the country's economic development and environmental preservation.

Certification plays a crucial role in the wood industry, particularly in devel-

¹³<https://www.nyulawglobal.org/globalex/Cameroon.html#:~:text=Republic%20of%20Cameroon.%202-,The%20Cameroonian%20Legal%20System,some%20sort%20of%20tenuous%20coexistence>

oping countries like Cameroon, bringing both challenges and opportunities. Lack of awareness and high costs are challenges faced by the industry. According to Alemagi *et al.* [38] highlight this challenge, stating that many small-scale wood producers in Cameroon are not familiar with the certification process and its benefits. Additionally, the cost of certification can be prohibitive for small-scale producers, who often lack the financial resources to meet the requirements. However, certification offers opportunities for improved market access and sustainable practices. Establishing a legal framework, enhancing government capacity, implementing certification schemes, and engaging stakeholders are steps to achieve legal compliance and certification [39]. The following step involves building the capacity of government institutions responsible for overseeing the wood industry, such as the Ministry of Forestry and Wildlife, by providing training and resources to improve their monitoring and enforcement capabilities. This includes strengthening the capacity for forest law enforcement, enhancing the skills and knowledge of personnel, and improving coordination among different agencies. The last step is to promote sustainable forest management practices, including the implementation of certification schemes. With these steps, the wood industry in Cameroon can ensure legal compliance and certification, which will not only contribute to forest conservation but also promote sustainable development and improve market access [40].

Certifications such as the FSC and the Programme for the Endorsement of Forest Certification (PEFC) offer immense potential for the wood transformation industry in Cameroon [41]. For instance, FSC certifications provide consumers with the assurance that the products they are purchasing come from sustainably managed forests. On September 28, 2020, the revised national standard of Cameroon received approval and was published by the FSC. It officially came into effect on December 29, 2020¹⁴ (Figure 6). This certification system not only addresses the environmental impact of forest management but also considers the social and economic aspects.

Ndumbe Berock and Ongolo [42] indicated that the benefits of FSC certifications in Cameroon's wood industry are numerous. Firstly, FSC certifications provide international recognition and market access for certified wood products, giving them a competitive advantage in global markets. Secondly, the certifications promote sustainable forest management practices, ensuring the long-term viability of Cameroon's forests and protecting biodiversity. Thirdly, FSC certifications help to improve the social conditions of workers in the wood industry by promoting fair labor practices and respecting the rights of indigenous communities. Moreover, implementing PEFC certifications in Cameroon's wood industry also poses challenges. One significant challenge is the need for capacity building [43]. The certification process requires adequate knowledge and resources to meet the standards set by PEFC, which may be lacking in some parts of Cameroon's wood industry. Additionally, ensuring compliance with certification

¹⁴https://cactus.ai/cactus_student?tool=chat&chat=1700652341079x907374312644411400

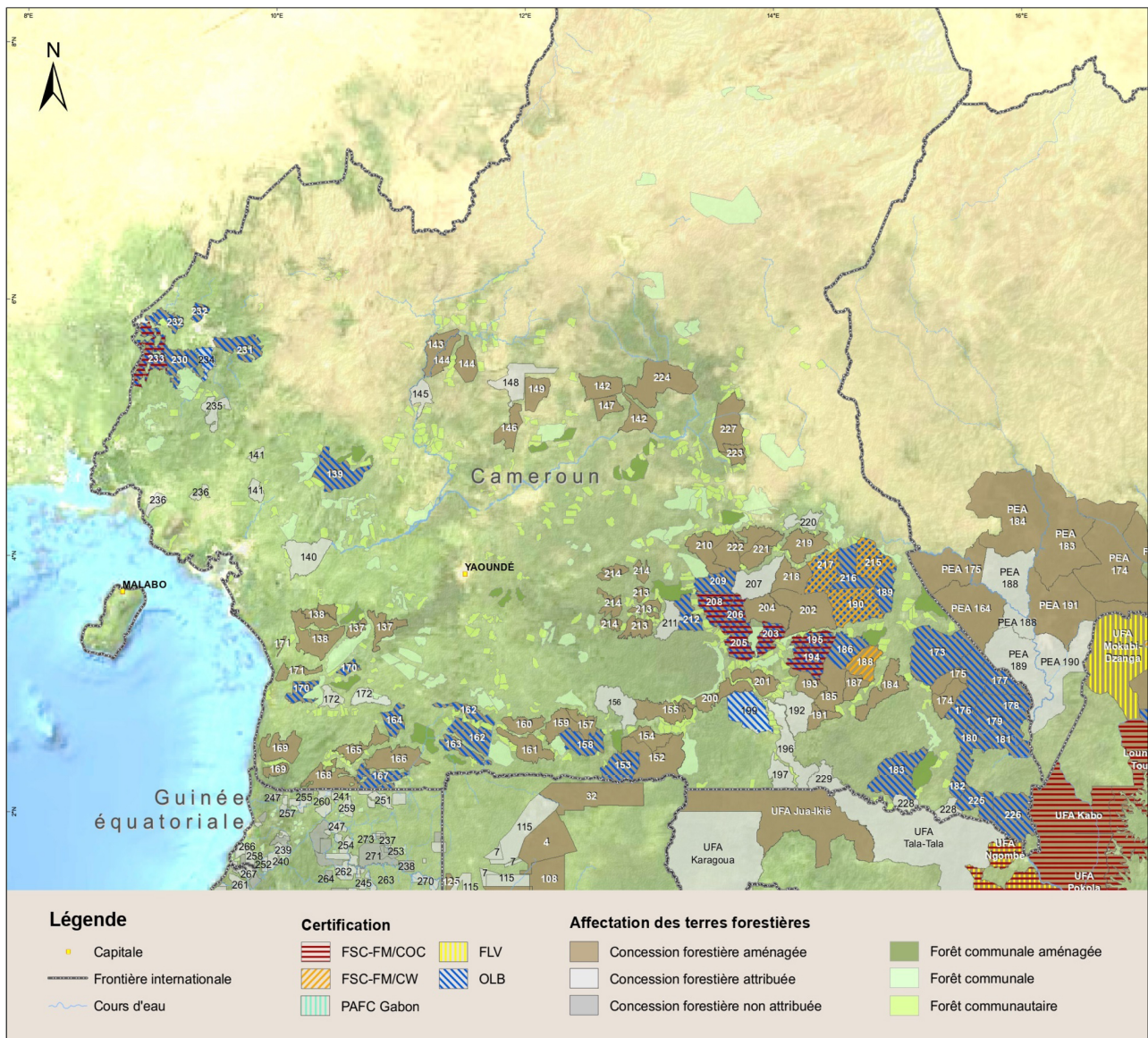


Figure 6. Certified forest concessions in Cameroon 2020¹⁵.

standards and maintaining the necessary documentation can be time-consuming and costly. FSC and/or PAFC-certified forests occupy 341,708 ha in Cameroon at the end of 2022¹⁶ (Figure 7).

These certifications not only promote sustainable forest management practices but also provide access to markets and enhance reputational advantages¹⁷. The VPA under the EU FLEGT Action Plan further presents lucrative opportunities for businesses operating in Cameroon. Carodenuto and Ramcilovic-Suominen [44], the VPA has had a significant impact on improving the governance and

¹⁵[https://www.observatoire-comifac.net/docs/postersA0/PosterA0_CF_certifications_20180530_V2a_Corr%20\(1\).pdf](https://www.observatoire-comifac.net/docs/postersA0/PosterA0_CF_certifications_20180530_V2a_Corr%20(1).pdf)

¹⁶<https://www.atibt.org/en/news/13289/10-million-hectares-to-be-certified-as-sustainably-managed-in-the-congo-basin-by-2025>

¹⁷https://sustainableforestproducts.org/Special_Forests

transparency of Cameroon's wood industry. Through the implementation of the VPA, the government of Cameroon has established a legality verification system, which requires all timber to be accompanied by a valid license. This system has helped to curb the illegal trade in timber and ensure that only legally harvested wood is exported. The FLEGT Action Plan is a significant initiative to combat illegal logging in Cameroon's wood industry [7] [45]. It aims to improve forest governance and law enforcement as a means to address this issue and promote sustainable forest management. The plan includes strategies such as strengthening legal frameworks, enhancing transparency, and involving local communities and stakeholders. Through the VPA-FLEGT scheme, companies can ensure the legality of their timber products and obtain FLEGT licenses, granting them verified legal status¹⁸. By steadfastly adhering to rigorous standards and tackling issues like corruption and legal compliance, businesses have the power to bolster sustainability measures and actively contribute to the preservation of Cameroon's precious forests through certification and VPA-FLEGT participation.

3.6. Promoting Investment and Market Expansion of Wood Industry in Cameroon

Promoting sustainable practices and policies is vital for attracting investment, ensuring long-term viability, and contributing to Cameroon's economic and environmental sustainability. By comprehensively understanding these aspects, Cameroon can foster a thriving wood industry, attracting both local and international investors, boosting economic growth, and promoting sustainable development. However, the industry faces significant challenges, including illegal logging, which leads to deforestation and biodiversity loss [46]. Ineffective regulations and enforcement exacerbate the problem, perpetuating illegal activities. Additionally, limited access to finance and technology hampers the ability of small and medium-sized enterprises (SMEs) to meet international standards and

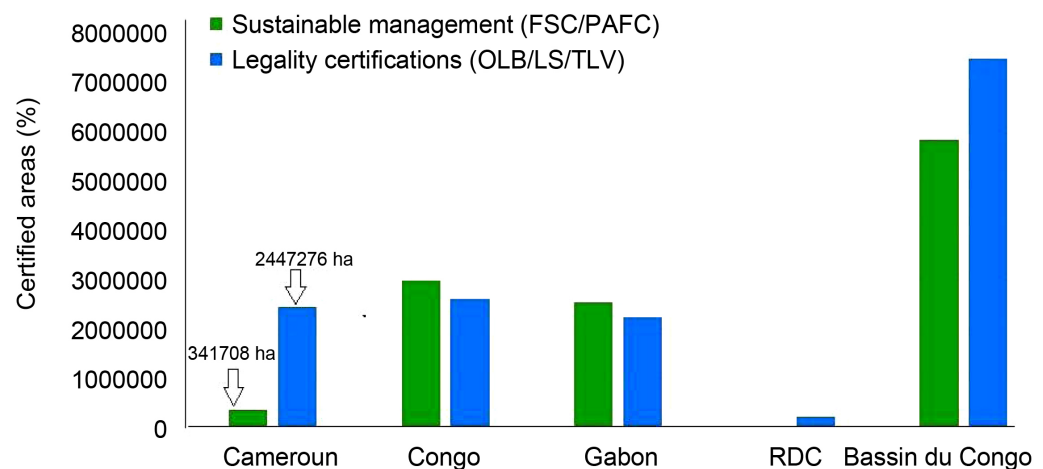


Figure 7. Congo Basin of forest certified as sustainably managed in 2022.

¹⁸<https://flegtvpafacility.org/countries/cameroon/background/>

access global markets. Nevertheless, amidst these challenges, there are opportunities for growth. The rising demand for sustainable and certified timber positions Cameroon as a reliable and responsible supplier. By implementing sustainable forest management practices and obtaining certification, Cameroon can attract environmentally conscious buyers and secure premium prices for its wood products. The government's commitment to strengthening the legal framework and improving governance in the sector also underscores the industry's potential.

To attract foreign investment, several strategies can be employed. Improving transportation and logistics infrastructure, such as investing in road networks, ports, and railways, would lower transportation costs and enhance the industry's competitiveness [33]. This investment would facilitate the smooth movement of wood products from production sites to export destinations, improving overall efficiency. Establishing favorable investment policies and regulations, including tax incentives, streamlined bureaucratic procedures, and clear ownership rights, would create a conducive business environment and instill confidence in potential investors [47]. Promoting sustainable practices, including responsible logging and forest resource protection, would appeal to environmentally conscious investors who prioritize sustainable development.

The wood industry in Cameroon faces challenges that hinder its growth potential, such as illegal logging, poor infrastructure, and limited value addition [48]. However, with sustainable forest resources and the adoption of appropriate strategies, the industry holds significant opportunities for growth. Factors influencing market expansion include the availability of raw materials and demand from domestic and international markets [48] [49]. Government policies and regulations play a crucial role in promoting sustainable forest management. To facilitate sustainable market expansion, it is important to adopt sustainable forestry practices, obtain certifications like FSC, and foster partnerships [38]. By addressing these challenges and implementing strategic approaches, Cameroon can unlock the potential of its wood industry and contribute to long-term economic and environmental sustainability.

4. Conclusion

The wood processing industry in Cameroon has immense growth potential. With abundant forest resources and a favorable location, Cameroon can capitalize on global demand for wood products, creating jobs and contributing to sustainable development. However, challenges like illegal logging must be addressed for the industry to reach its full potential. By implementing sustainable practices, Cameroon can establish itself as a key player in the global market, benefiting the country and its people. In conclusion, the wood processing industry in Cameroon offers significant opportunities for economic growth and sustainable development through infrastructure development, technological upgrades, domestic processing, and skill development.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Sosale, S. and Majgaard, K. (2016) Fostering Skills in Cameroon: Inclusive Workforce Development, Competitiveness, and Growth. World Bank, Washington DC. <https://doi.org/10.1596/978-1-4648-0762-6>
- [2] Mboumboue, E. and Njomo, D. (2018) Biomass Resources Assessment and Bioenergy Generation for a Clean and Sustainable Development in Cameroon. *Biomass and Bioenergy*, **118**, 16-23. <https://doi.org/10.1016/j.biombioe.2018.08.002>
- [3] Nzotcha, U. and Kenfack, J. (2019) Contribution of the Wood-Processing Industry for Sustainable Power Generation: Viability of Biomass-Fuelled Cogeneration in Sub-Saharan Africa. *Biomass and Bioenergy*, **120**, 324-331. <https://doi.org/10.1016/j.biombioe.2018.11.015>
- [4] Ngaba, M.J.Y., Michel-Cédric, Y.E., Benenguegne, M.C., Kobla, A.S. and Simon, N.N. (2023) Challenges of Wood Transformation Industry in Cameroon: A Holistic Overview. *Open Access Library Journal*, **10**, e10855. <https://doi.org/10.4236/oalib.1110855>
- [5] Chupezi, T.J. (2009) Sustainable Forest Management in Cameroon. Search of Common Ground, Washington DC.
- [6] Cerutti, P.O., Nasi, R. and Tacconi, L. (2008) Sustainable Forest Management in Cameroon Needs More than Approved Forest Management Plans. *Ecology and Society*, **13**, Article 36. <https://doi.org/10.5751/ES-02591-130236>
- [7] Ferdinand, M., Martin, M., Patrick, K.M., Forbuizie, T.P. and Junior, M.Y.N. (2021) Contribution à l'évaluation de la mise en oeuvre de l'APV-FLEGT au Cameroun. *International Journal of Innovation and Applied Studies*, **32**, 330-345.
- [8] Defo, L. (2023) Six Years of Industrial Logging in Ngoyla (East-Cameroon): What Have Been the Outcomes for Local Populations? *International Forestry Review*, **25**, 91-112. <https://doi.org/10.1505/146554823836902653>
- [9] Ngaba, M.J.Y. (2011) Description d'une chaîne de transformation de bois en milieu tropical: Cas de la Société Nouvelle de Contreplaqué du Cameroun (SN COCAM). Université de Dschang, Researchgate.
- [10] Ngaba, M.J.Y. (2012) Projet de mise en place d'un système de tracabilité à la STBK (Société de Transformation du Bois de la Kadey). Université de Dschang, Researchgate.
- [11] Cerbu, G., Chevignon, C., Groutel, E., Lescuyer, G., Essiane Mendoula, E., Tsanga, R., Peroches, A., *et al.* (2016) Central Africa Congo Basin Timber: Case Studies of Urban Wood Products Markets in the Democratic Republic of Congo and Cameroon. World Bank, Washington DC.
- [12] Bernard Tabih, K. (2021) The Influence of Road Transport Network in the Marketing of Agricultural Products in the Makenene Subdivision, Cameroon. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4150815
- [13] Veeyee, K.F., Bup, N.D., Boldor, D. and Elambo, N.G. (2021) Potentials of Sustainable Electricity Production from Sawdust by Small-Scale Wood Transformation Units: A Case Study in Cameroon. *International Journal of Energy and Environmental Engineering*, **12**, 101-114. <https://doi.org/10.1007/s40095-020-00362-0>
- [14] Adom, P.K. (2016) The Transition between Energy Efficient and Energy Inefficient

- States in Cameroon. *Energy Economics*, **54**, 248-262.
<https://doi.org/10.1016/j.eneco.2015.11.025>
- [15] Flora, F.M.I., Donatien, N., Donatien, N., Tchinda, R. and Hamandjoda, O. (2019) Impact of Sustainable Electricity for Cameroonian Population through Energy Efficiency and Renewable Energies. *Journal of Power and Energy Engineering*, **7**, 11-51.
<https://doi.org/10.4236/jpee.2019.79002>
- [16] Etoundi, R.A., Onana, F.S.M., Olle, G.D.O. and Eteme, A.A. (2016) Development of the Digital Economy in Cameroon: Challenges and Perspectives. *The Electronic Journal of Information Systems in Developing Countries*, **76**, 1-24.
<https://doi.org/10.1002/j.1681-4835.2016.tb00558.x>
- [17] Tissari, J., Taplah, A. and Kamara, E.S. (2008) World Bank Diagnostic Trade Integration Study: Wood Industry Component.
<https://www.fao.org/forestry/23514-0844c34823f11a36c65f6587345dc2b1d.pdf>
- [18] Khan, M.N., Huang, J., Li, D., Daba, N.A., Han, T., Du, J., Haseeb, A., et al. (2022) Mitigation of Greenhouse Gas Emissions from a Red Acidic Soil by Using Magnesium-Modified wheat Straw Biochar. *Environmental Research*, **203**, Article ID: 111879. <https://doi.org/10.1016/j.envres.2021.111879>
- [19] Danwe, R., Bindzi, I. and Meva'a, L. (2012) Optimization of Sawing in Wood Transformation Primary Industries. *Journal of Industrial Engineering and Management*, **5**, 115-132. <https://doi.org/10.3926/jiem.374>
- [20] Draft, C. (2012) Green Growth and Developing Countries.
<https://www.oecd.org/dac/environment-development/50559116.pdf>
- [21] Kenfack, S.M.W. (2021) North-South Collaboration for a Manufacturing Extension Development Program: Case of Secondary Wood Manufacturing Industries in Indiana and Cameroon. Master's Thesis, Purdue University, West Lafayette.
- [22] Tingum, E.N. and Ofeh, M.A. (2017) Technical Efficiency of Manufacturing Firms in Cameroon: Sources and Determinants. *International Journal of Financial Research*, **8**, 172-186. <https://doi.org/10.5430/ijfr.v8n3p172>
- [23] Asumadu, K. (2004) Development of Wood-Based Industries in Sub-Saharan Africa: Asumadu & Associates.
https://afforum.org/oldaff/sites/default/files/English/English_126.pdf
- [24] ANRC: African Natural Resources Centre (2021) Wood Processing and Trade of Wood Products in Africa. African Development Bank, Abidjan.
- [25] Njimanted, G.F. and Aquilas, N.A. (2015) The Impact of Timber Exports on Economic Growth in Cameroon: An Econometric Investigation. *Asian Journal of Economic Modelling*, **3**, 46-60. <https://doi.org/10.18488/journal.8/2015.3.3/8.3.46.60>
- [26] Söderling, L. (1999) Structural Policies for International Competitiveness in Manufacturing: The Case of Cameroon. OECD Development Centre Working Paper No. 146. <https://doi.org/10.2139/ssrn.191148>
- [27] Duguma, B., Gockowski, J. and Bakala, J. (2001) Smallholder Cacao (*Theobroma cacao* Linn.) Cultivation in Agroforestry Systems of West and Central Africa: Challenges and Opportunities. *Agroforestry Systems*, **51**, 177-188.
<https://doi.org/10.1023/A:1010747224249>
- [28] Lesníková, P. and Kánová, M. (2020) Sustainable Development Goal Industry and Innovation: Challenge for Wood-Processing Industry in Slovakia. Proceedings of Scientific Papers, 165.
- [29] Hurmekoski, E., Jonsson, R., Korhonen, J.E., Jänis, J., Mäkinen, M., Leskinen, P. and Hetemäki, L. (2018) Diversification of the Forest Industries: Role of New

- Wood-Based Products. *Canadian Journal of Forest Research*, **48**, 1417-1432.
<https://doi.org/10.1139/cjfr-2018-0116>
- [30] Tieguhong, J.C., Kowero, G. and Mandiefe, S.P. (2019) Promoting African Integration through Trade in Forest Products: Cameroon's Perspective. *African Journal of Rural Development*, **4**, 155-171.
- [31] Kimbu, A.N. (2010) Sustainable Tourism Development Management in Central Africa: A Case Study of the Tourism Industry in Cameroon.
https://irep.ntu.ac.uk/id/eprint/185/1/198177_AN%20Kimbu.pdf
- [32] Sharma, S., Sethi, G.R., Gupta, U. and Chaudhury, R.R. (2015) Barriers and Facilitators to Development of Standard Treatment Guidelines in India. *WHO South-East Asia Journal of Public Health*, **4**, 86-91.
<https://doi.org/10.4103/2224-3151.206626>
- [33] Essama-Nssah, B. and Gockowski, J.J. (2000) Cameroon: Forest Sector Development in a Difficult Political Economy. World Bank, Washington DC.
- [34] Ngaba, J. (2020) Elvis Mouyakan A Moumbock Société R. Pallisco.
https://www.academia.edu/43756700/Elvis_Mouyakan_A_Moumbock_Soci%C3%A9t%C3%A9_R_Pallisco
- [35] Mvondo, S.A. (2009) State Failure and Governance in Vulnerable States: An Assessment of Forest Law Compliance and Enforcement in Cameroon. *Africa Today*, **55**, 85-102. <https://doi.org/10.2979/AFT.2009.55.3.84>
- [36] Sieböck, G. (2002) A Political, Legal and Economic Framework for Sustainable Forest Management in Cameroon: Concerted Initiatives to Save the Rainforests. Master's Thesis, Lund University, Lund.
https://www.lumes.lu.se/sites/lumes.lu.se/files/sieboeck_gregor.pdf
- [37] Amariei, L. (2005) Legal Compliance in the Forest Sector: A Case Study of Cameroon. Final Report. FAO, Rome.
- [38] Alemagi, D., Hajjar, R., David, S. and Kozak, R.A. (2012) Benefits and Barriers to Certification of Community-Based Forest Operations in Cameroon: An Exploratory Assessment. *Small-Scale Forestry*, **11**, 417-433.
<https://doi.org/10.1007/s11842-011-9192-9>
- [39] Cerutti, P.O., Tacconi, L., Nasi, R. and Lescuyer, G. (2011) Legal vs. Certified Timber: Preliminary Impacts of Forest Certification in Cameroon. *Forest Policy and Economics*, **13**, 184-190. <https://doi.org/10.1016/j.forpol.2010.11.005>
- [40] Moumbock, E.M.A., Ngaba, M.J.Y. and Angwafo, T.E. (2021) Hautes Valeurs de Conservation de Types 5 et 6.
https://www.researchgate.net/publication/340663370_Gestion_durable_des_Hautes_Valeurs_de_Conservation_de_types_5_et_6_dans_les_UFA_gerees_par_la_societe_forestiere_Pallisco_Identification_cartographie_et_enjeux_pour_la_conservation
- [41] Larrea, C., Campos, S.L. and Voora, V. (2021) Voluntary Sustainability Standards, Forest Conservation, and Environmental Provisions in International Trade Policy.
<https://www.iisd.org/system/files/2021-10/voluntary-sustainability-standards-forest-conservation-trade-policy.pdf>
- [42] Ndoumbe Berock, I. and Ongolo, S. (2019) Why Do Logging Companies Adopt or Reject Forest Certification in the Congo Basin? Insights from Cameroon. *International Forestry Review*, **21**, 341-349. <https://doi.org/10.1505/146554819827293213>
- [43] Wolff, S. and Schweinle, J. (2022) Effectiveness and Economic Viability of Forest Certification: A Systematic Review. *Forests*, **13**, Article 798.
<https://doi.org/10.3390/f13050798>

-
- [44] Carodenuto, S. and Ramcilovic-Suominen, S. (2014) Barriers to VPA implementation: A Case Study of Cameroon's Private Forestry Sector. *International Forestry Review*, **16**, 278-288. <https://doi.org/10.1505/146554814812572502>
- [45] Ackom, E.K., Alemagi, D., Ackom, N.B., Minang, P.A. and Tchoundjeu, Z. (2013) Modern Bioenergy from Agricultural and Forestry Residues in Cameroon: Potential, Challenges and the Way Forward. *Energy Policy*, **63**, 101-113. <https://doi.org/10.1016/j.enpol.2013.09.006>
- [46] Cerutti, P.O., Mbongo, M. and Vandenhoute, M. (2016) État du secteur forêts-bois du Cameroun (2015). Food and Agriculture Organization.
- [47] Sola, P., Schure, J., Eba'a Atyi, R., Gumbo, D., Okeyo, I. and Awono, A. (2019) Woodfuel Policies and Practices in Selected Countries in Sub-Saharan Africa—A Critical Review. *Bois et Forêts des Tropiques*, **340**, 5-19. <https://doi.org/10.19182/bft2019.340.a31690>
- [48] Marius, L.L. and Joel, N.A. (2019) Energy Sector of Cameroon. *Africa Review*, **11**, 34-45. <https://doi.org/10.1080/09744053.2018.1538678>
- [49] Sama, M. and Aquilas, N.A. (2016) Determinants of Timber Exports in Cameroon. *International Journal of Development and Economic Sustainability*, **4**, 21-33.